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ABSTRACT

Word and nonword vocalizations produced by two groups of children aged 8-28 months were studied. The first group included six children whose speech was recorded monthly for 12 months. The second group contained 21 children. In both, only spontaneous vocalizations were recorded. Each sample was examined for frequency of word and nonword forms. A word was defined as a phonetic form recognizable to both caregiver and researcher and used consistently and meaningfully. A nonword production was any phonetically transcribable vocalization not considered a word. Reflexive vocalizations (e.g., sneezes) were not used. Nonwords accounted for over 50% of vocalization before 19 months, with a gradual decrease to 20% by 25 months. All children were still producing nonword vocalizations at the end of the study, suggesting that nonwords contribute to vocalization of children actively acquiring language. It is suggested that some nonwords identified in later periods of the study also functioned pragmatically as words. In addition, frequency of usage and difficulty in distinguishing between words and nonwords open to question the relevance of the distinction. It is concluded that both word and nonword forms should be given special consideration in the assessment of a child's articulatory capabilities. A 22-item bibliography is included. (MSE)

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Developmental comparison of children's word and nonword vocalizations

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ABSTRACT

The word and nonword vocalizations produced by two groups of young children between 8-28 months of age are reported. The first group was comprised of a longitudinal sample of six children who were audio recorded monthly for a 12-month period. The second group consisted of a cross sectional sample of 21 children. Each child's vocalization sample was examined for the frequency of occurrence of word (phonetically "adult-like") and nonword (unintelligible but phonetically transcribable) forms. Generally, both word and nonword forms occurred frequently during the first two years of life. The discussion focuses on the relevance of sampling all nonreflexive vocalizations when examining young children's speech development.

INTRODUCTION

A child's early vocal development is usually described with respect to a stage model of development. Several versions of the "stage model" have been published but they differ somewhat regarding the number of stages recognized, the particular characteristics of each stage, and the age period covered. However, most models recognize the following major stages, referenced according to chronological (Figure 1): (1) First, reflexive and cry vocalizations, usually thought to occur during the first month of life, (2) followed by cooing or gooing, where the basic syllable shapes (V, CV) and approximate consonants (/k & g/) are identified during the ages of two-to-three months; (3) reduplicated or canonical babbling occurs by six months, where the same CV syllable shape is produced in repetitive strings; (4) followed by variegated or nonreduplicated babbling, where the variety of sounds and syllable strings produced increases markedly by eight months of age; and finally (5) single-word production, which occurs around 12 months of age.

Stages of development serve as a useful general framework for organizing early vocalization behaviors (Proctor, 1989). However, because they are descriptive and somewhat impressionistic they can become obsolete and their inadequacies become more obvious (Shatz, 1983). For example, Mitchell and Kent (1990) and Smith et al. (1989) recently suggested that reduplicated and variegated babbling are not separate stages of vocal development since they were found to co-occur.

The single-word stage of development is another example of categorical thinking, where once a child attains the stage of single-word production s/he is thought of as producing strictly word forms. The first instance of word use, though, is far from typical of what a child actually produces during this period. A young child can often be observed to produce other unintelligible (or **NONWORD**) vocalizations (Messick, 1984). What we mean by **NONWORD** vocalizations is any phonetically transcribable vocalizations which doesn't remotely "match" an adult word. This excludes reflexive vocalizations such as burping and sneezing.

There is a considerable body of phonetic information related to children's single-word vocalization behavior excludes **NONWORD** forms (Dyson, 1988; Stoel-Gammon, 1985, 1987). This process of distinguishing between **WORDS** and **NONWORDS** is known as data filtering (Scollon, 1976). In essence, if a child's vocalization does not overlap in some intelligible way with the listener's native language, the utterance is selectively disregarded. Subsequently, data filtering may serve to create a biased view of speech development.

An issue rarely addressed in speech development is the simultaneous occurrence of, and relationship between, **WORD** and **NONWORD** vocalizations. Recent investigators have considered the acoustic and phonetic characteristics of young children's **WORD** and **NONWORD** forms in an attempt to evaluate the continuity in development between preword and early word periods. For example, Vihman et al. (1985) evaluated the **WORD** and **NONWORD** vocalizations of children between 9 and 16 months of age and

found similarity in the distribution of syllable shapes and consonants. Robb and Saxman (1990) examined the **WORD** and **NONWORD** bisyllable duration patterns in children between 8 and 26 months and observed consistent final syllable lengthening. Results of both studies provide evidence of considerable similarity in the acoustic and phonetic structure of **WORD** and **NONWORD** vocalizations across the first two years of life, thus, supporting a continuity view of development.

Although previous research indicates acoustic and phonetic commonality between the two forms, longitudinal and multi-subject data do not exist regarding the proportional occurrence of **WORD** and **NONWORD** forms. The purpose of this study was to quantify the occurrence of **WORD** and **NONWORD** forms as a means of addressing the larger issue of vocalization sampling. We wanted to know how often, and to what extent, do **WORD** and **NONWORD** forms co-occur in a child's vocalization behavior?

METHOD

SUBJECTS

We sought to determine the developmental occurrence of **WORD** and **NONWORD** forms by using two subject sampling paradigms - longitudinal and cross-sectional. By sampling separate groups of children in this way, the results obtained from one paradigm could be used to verify or cross-validate results from the other.

The longitudinal sample consisted of six normally developing infants (3 boys & 3 girls). At the onset of the study, the children ranged in age from 8-14 months (M = 10 months).

Spontaneous vocalization samples were audio recorded from each child at 12 monthly intervals. At the conclusion of data collection, the children ranged in age from 19 to 25 months. The cross-sectional sample consisted of 21 normal children (9 boys, 12 girls), overlapping approximately the same age range as the longitudinal sample (10 to 28 months). Similar to the longitudinal samples, only spontaneous vocalizations were collected. A minimum of 50 vocalizations were collected in each session, using a lapel microphone.

WORD AND NONWORD CATEGORIZATION

The criteria for separating a child's **WORD** and **NONWORD** vocalizations used both environmental contexts and the caregiver's judgment at the moment of production. For each vocalization, a decision was made whether or not it was an adult-based **WORD**. A child was given credit for a **WORD** production if s/he produced a phonetic form that was a recognizable attempt at the adult **WORD**. It was not required that a **WORD** be pronounced exactly like the adult model, as long as it was used in a consistent, meaningful way. Determination of **WORDS** was based on 100% agreement between the caregiver and researcher. A **NONWORD** production was any phonetically transcribable vocalization which was not considered a **WORD** (such as variegated babbling or phonetically consistent forms). Reflexive vocalizations such as coughing, burping, or sneezing were not included in the data base.

RESULTS

INDIVIDUAL DATA

Beginning with the data collected from the longitudinal sample of six children. The total number of vocalizations considered in the comparison of **NONWORDS** and **WORDS** was 4189. The number of **NONWORDS** produced by the children in a single session ranged from 3 (S3) to 70 (S4). The number of **WORDS** produced in a single session ranged from 2 (S4) to 78 (S5).

The percent occurrence of **NONWORD** and **WORD** forms in each child's monthly vocalization sample are displayed as reciprocals in the next series of figures (Figures 2-4). The majority of each child's monthly samples contained both **NONWORD** and **WORD** vocalizations. For all of the children the **NONWORD** and **WORD** graphs intersected, representing a decrease in percentage of **NONWORD** forms and concomitant increase in **WORD** forms as a function of age. This general area of intersection was interpreted to reflect the approximate age period when a child's production of **WORD** and **NONWORD** forms was roughly equivalent. For S1 and S2, this point of equivalence occurred between 13 and 15 months of age (refer to Figure 2).

The **NONWORD** and **WORD** reciprocals for S3 and S4 are shown in Figure 3. For S3, the point of **WORD** and **NONWORD** equivalence was between 13 and 15 months, and for S4 it occurred around 20 months of age.

Upon examination of the last 2 longitudinal subjects, **NONWORDS** were used more than 50% of the time by S5 until approximately 21 months, tapering off to 10% use at 25 months of

age. The point of **NONWORD/WORD** equivalence was around 20 months. For S6, **NONWORDS** and **WORDS** were used in fairly equal numbers between 18 and 21 months of age (refer to Figure 4).

GROUP DATA

To evaluate the occurrence of **NONWORD** and **WORD** forms according to the entire group, the individual longitudinal data were collapsed across all ages. The group percent occurrence of **NONWORDS** and **WORD** forms spanning the age range of 10 months to 25 months, is displayed in Figure 5. The percentage of **NONWORD** vocalizations produced by the group ranged from 93% (11 mos) to 16% (25 (mos); while **WORD** productions ranged from 7% (11 mos) to 86% (25 mos).

There are at least two findings which can be gleaned from the group figure. First, the period of 16 to 18 months of age would seem to be the time frame when children are using a high proportion of both **WORD** and **NONWORD** forms when they vocalize. Secondly, it's interesting to note that even by 25 months of age, childrens vocalizations still contain **NONWORD** forms.

CROSS SECTIONAL VALIDATION

As a means of calibrating the **WORD** and **NONWORD** data obtained for the longitudinal sample of 6 children, the cross-sectional sample of 21 children was introduced. The total number of vocalizations considered in this comparison of **NONWORDS** and **WORDS** was 1506 (Ws = 860, NWs = 646). The resulting **WORD** and **NONWORD** proportions for the individuals comprising the cross-sectional

group, in comparison to the longitudinal data, are displayed in Figure 6.

Although the recripocal trend lines are not as "clean" looking as those from the longitudinal sample is is clear that (1) NONWORDS occurr with equal frequency as WORDS between 15 and 22 months, and (2) NONWORDS persist in children's vocalizations as late as 28 months of age.

DISCUSSION

In the present study, NONWORDS occurred frequently in the vocalizations of children between 8 and 28 months of age. NONWORDS accounted for over 50% of the children's vocalization behavior prior to 19 months of age, with a gradual decrease in proportion to approximately 20% by 25 months of age. At the conclusion of data collection, all children were still producing NONWORD vocalizations. This held true for both longitudinal and cross-sectional sampling paradigms. This finding would imply that NONWORDS continue to play a contributing role in the vocalization behavior of children actively acquiring language.

The development of WORD forms between one and two years of age is an obvious event. On the other hand, the developmental course of NONWORD forms is less clear. Because of maturational and environmental influences, NONWORD vocalizations produced by the children during the latter half of the data collection period were most likely different in form and function than their earliest NONWORD vocalizations. The NONWORDS identified at the

latter age periods may, in fact, have been pragmatically functioning as WORDS. Yet without knowing the pragmatic and developmental history of the particular WORDS, in association with the general unintelligible (but phonetically transcribable) nature of young children's vocalizations, the dilemma associated with separating WORDS from NONWORDS remains.

Because of the frequent occurrence of both WORD and NONWORD vocalizations, one must question the relevance of distinguishing between the two forms, especially when attempting to describe a child's early vocal development. Further, it is no small task to segment an infant's vocal output (Stockman et al., 1981) or for that matter, to determine when a vocalization is indeed adult-like (Oller, 1978). Thus judgments as to WORD status during this early period would seem to be open to question, due to the arbitrary, impressionistic procedures involved in making such decisions.

In conclusion, the present findings suggest that both WORD and NONWORD forms require special consideration in the assessment of a child's articulatory abilities. By considering both forms, one overcomes the exclusion premises of a stage model description. In other words, the full range of a child's vocal output is examined, with emphasis placed on description of observable rather than inferential behavior. Just as the study of phonological disorders is an important area of adult speech research, the systematic study of WORD and NONWORD forms may be an overlooked and important area of early speech acquisition.

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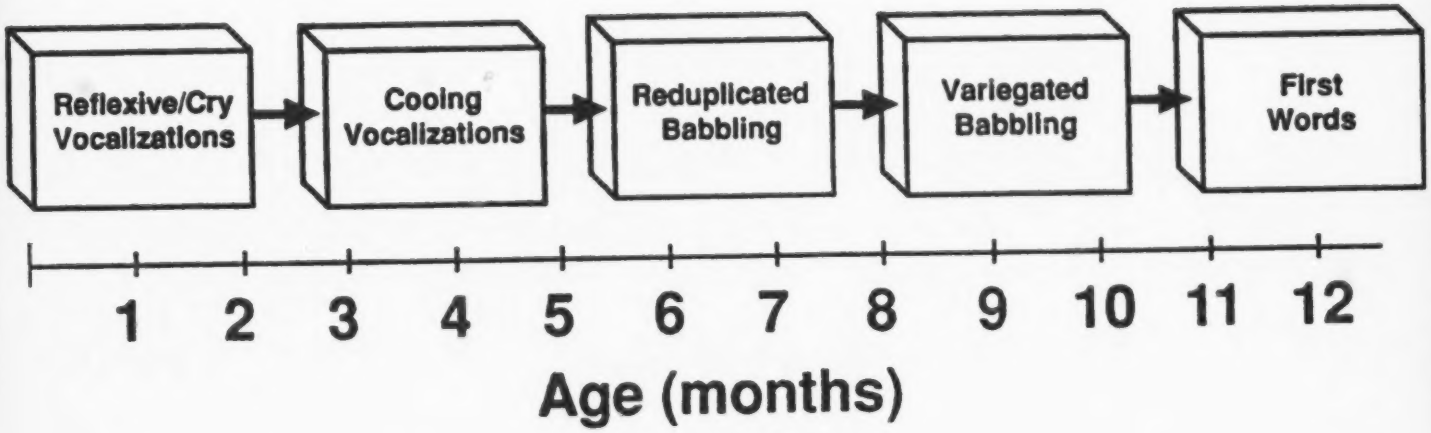
FIGURE 1

Stages of Vocal Development



Sources: Koopmans-van Beinum et al., 1986; Oller, 1980; Proctor, 1989; Roug et al., 1989; Stark, 1980.

FIGURE 2

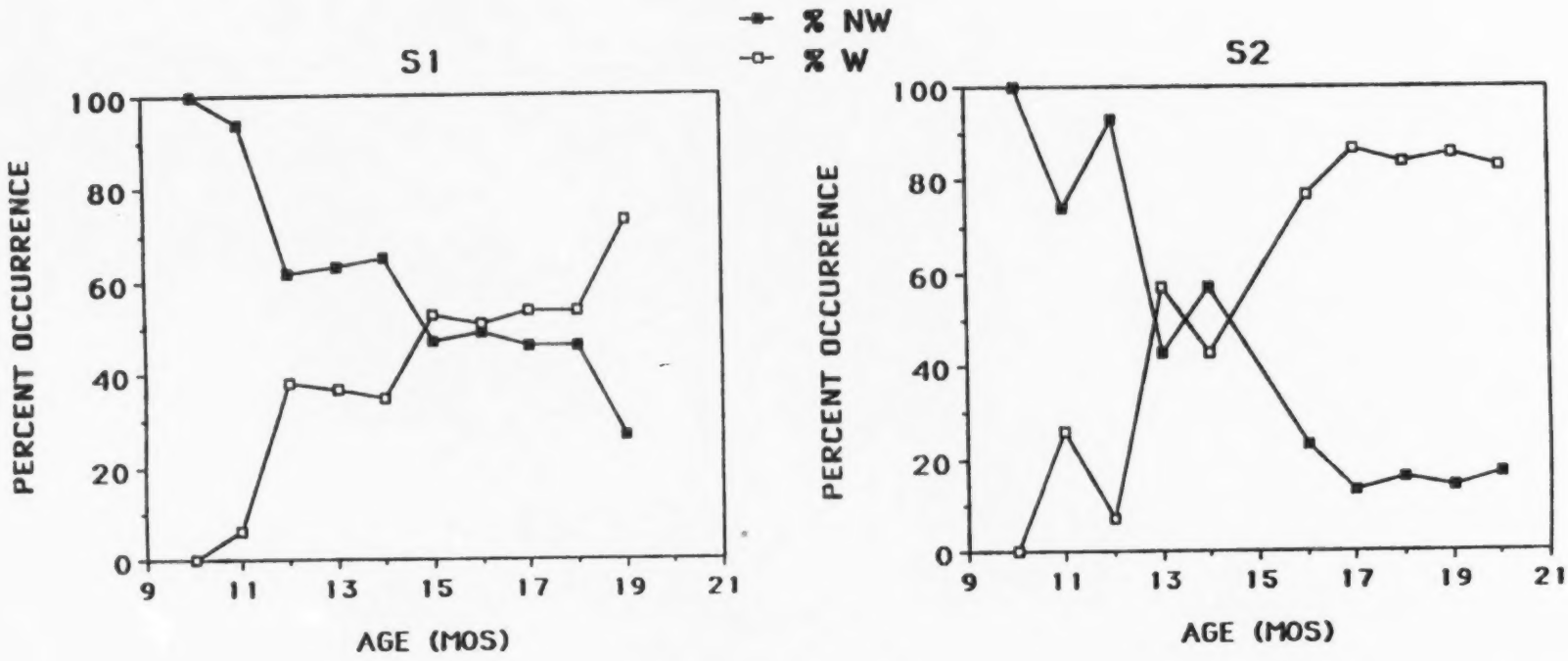
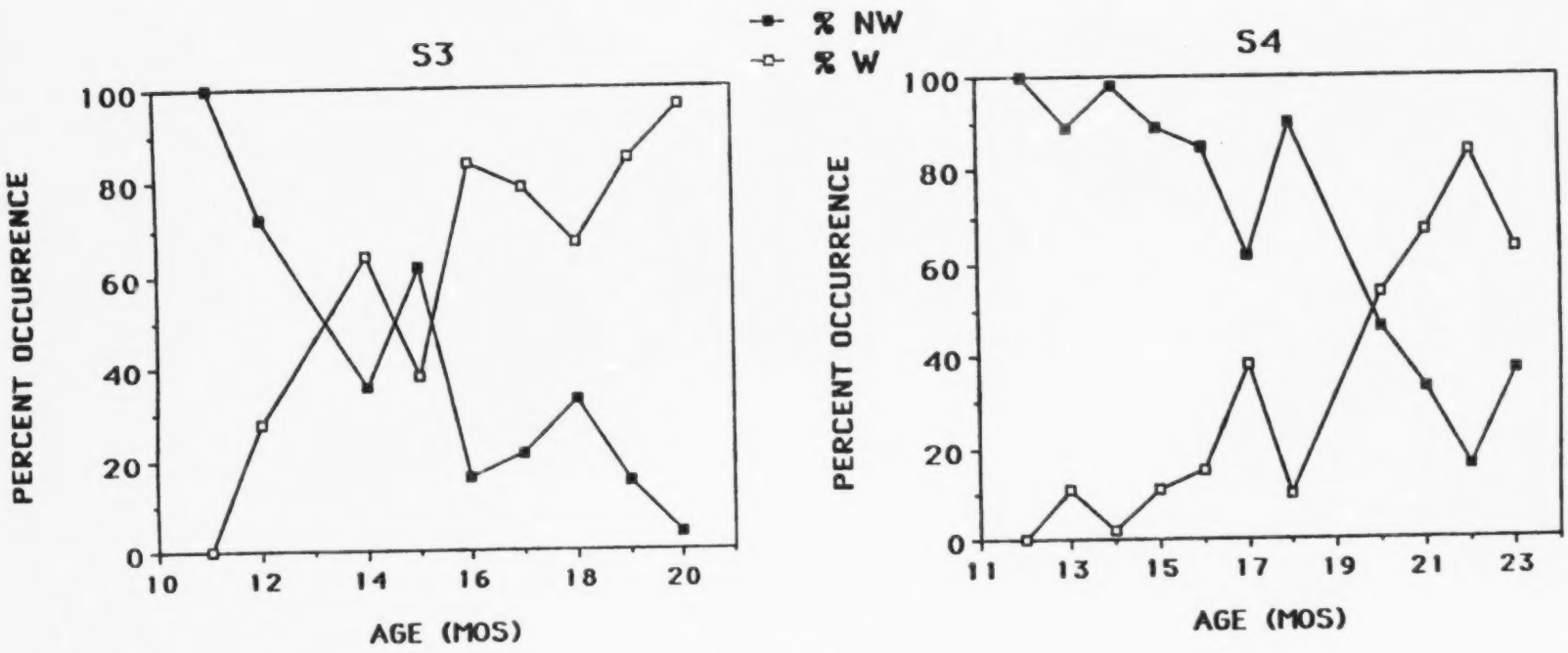

% NW
% W
S1
S2
PERCENT OCCURRENCE
AGE (MOS)
0
20
40
60
80
100
9
11
13
15
17
19
21

FIGURE 3


% NW
% W
S3
S4
PERCENT OCCURRENCE
AGE (MOS)
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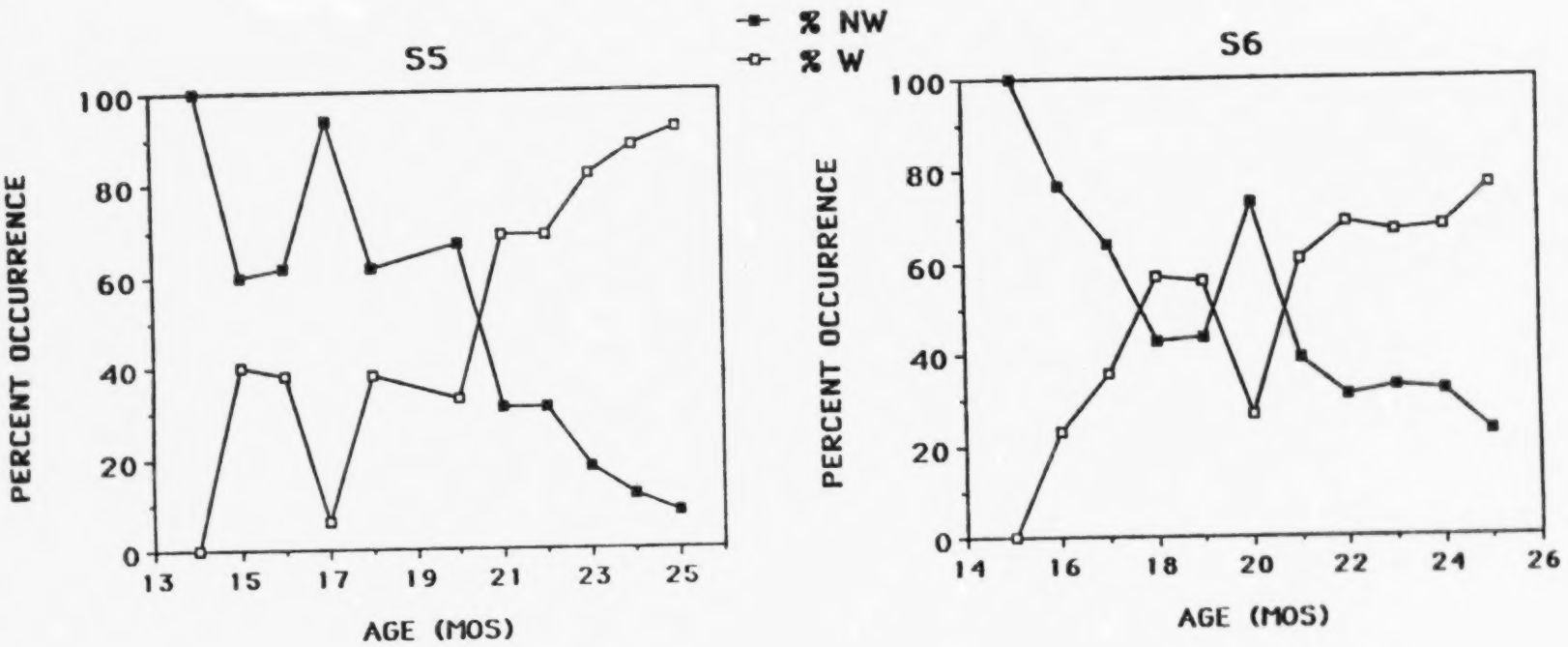
14
16
18
20
11
13
15
17
19
21
23

FIGURE 4


% NW
% W
S5
S6
PERCENT OCCURRENCE
AGE (MOS)
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40
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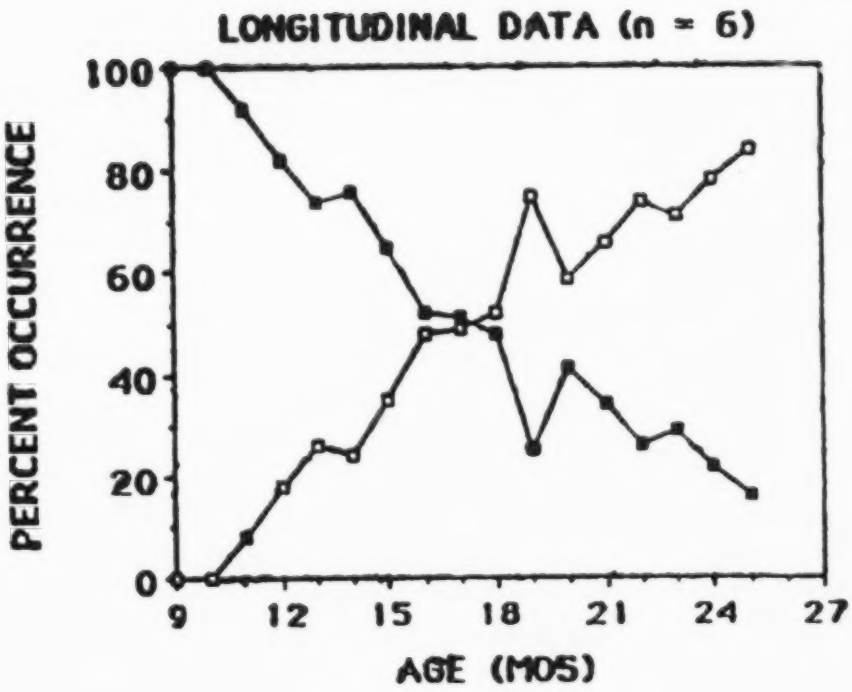
21
23
25
14
16
18
20
22
24
26

FIGURE 5


LONGITUDINAL DATA (n = 6)
PERCENT OCCURRENCE
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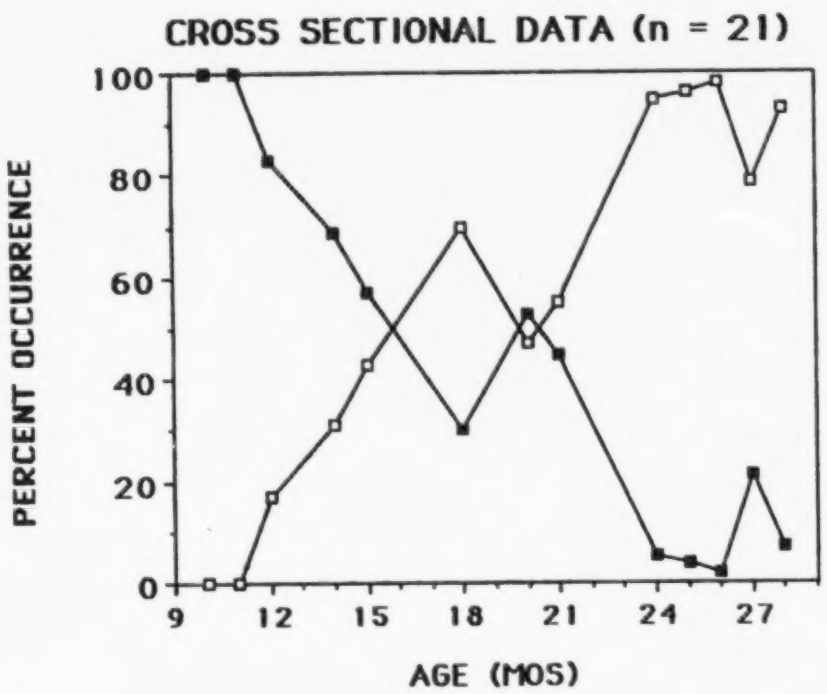
40
20
0
9
12
15
18
21
24
27
AGE (MOS)

FIGURE 6


CROSS SECTIONAL DATA (n = 21)
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12
15
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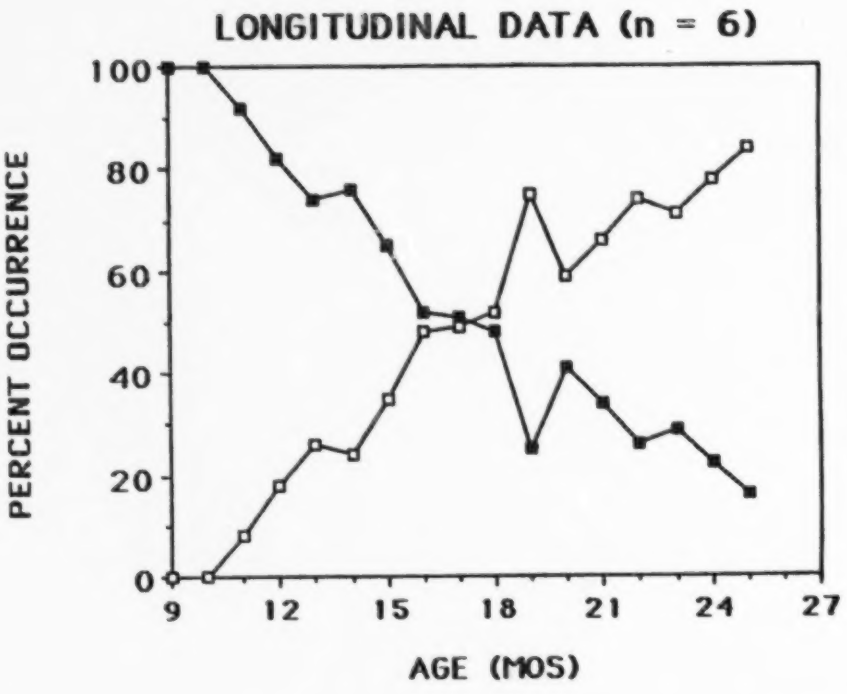
21
24
27
AGE (MOS)


LONGITUDINAL DATA (n = 6)
PERCENT OCCURRENCE
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80
60
40
20
0
9
12
15
18
21
24
27
AGE (MOS)